DOCUMENT RESUME

ED 165 974 RC 011 159

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TITLE	101 Environmental Education Activities. Booklet 3--Mathematics Activities.
INSTITUTION	Upper Mississippi River ECO-Center, Thomson, Ill.
SPONS AGENCY	Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.
PUB DATE	77
NOTE	34p.; Best copy available
AVAILABLE FROM	Upper Mississippi River ECO-Center, Thomson, Illinois 61285 ($1.00)
EDRS PRICE	MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS	*Activities; Cartography; Curriculum Enrichment; *Curriculum Guides; Educational Games; Educational Objectives; *Elementary Secondary Education; *Environmental Education; Evaluation Criteria; Experiential Learning; Instructional Materials; Maps; Mathematical Applications; Mathematical Concepts; Mathematics Education; *Mathematics Instruction; Mathematics Materials; Metric System; *Outdoor Education
IDENTIFIERS	Compass Activities; Elementary Secondary Education Act Title III; *Upper Mississippi River ECO Center

ABSTRACT

Each of the 14 environment-related mathematics activities included in this publication by the Upper Mississippi River ECO-Center includes objectives, materials needed, preparation, and activity description. Occasionally, variations and helpful hints are added. Because the student can gain experience to help him with the practical application of abstract concepts by studying mathematics outdoors, special emphasis is given to the experiential study of metrics and the magnetic compass. The overall focus of the activities is on the use of mathematics in real life situations. Metrics activities include body measurements, pacing and measuring distances, and estimating heights. Compass activities include an introduction to the use of the magnetic compass, geometric figures, an introduction to mapping, constructing/teaching mapping courses, and games. In addition there are pollution, energy, and nature studies. The activities are designed to enhance elementary and junior high school students' awareness of mathematics found in nature, such as geometric shapes, and to teach metrics, the compass, and applied mathematics. This is the third in the series of environmental activities booklets by the ECO-Center, and is also related to their inservice Teaching Manual for environmental education. (SB)

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101 ENVIRONMENTAL EDUCATION ACTIVITIES

ED165974

BOOKLET #3

MATHEMATICS ACTIVITIES

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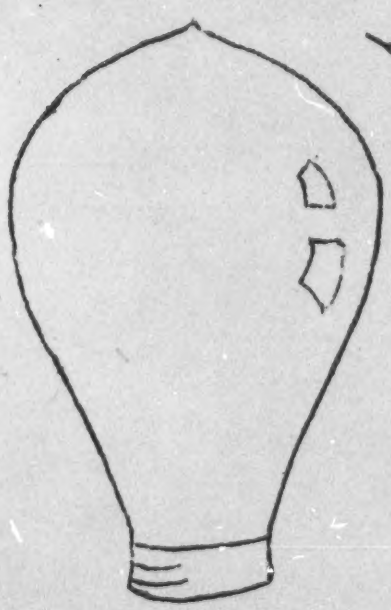
Social Studies
Outdoor Education
Language Arts
Mathematics
Art and Music



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ECO-Center Diffusion Project
Title IVc, ESEA
Thomson, Illinois
Dennis Etnyre, Director
Staff
Bruce Floyd
Roger Schaljo

Edited and compiled
by
Roger Schaljo

These activities are designed for teacher-pupil use and may be repreoduced in whole or in part.

101 Environmental Education Activities

Booklets:

1. Art and Music Activities
2. Language Art Activities
3. Mathematics Activities
4. Science Activities
5. Science and Social Studies (Interdisciplinary) Activities
6. Social Studies Activities

MATHEMATICS

Contents

Activity	Description of Activity
1	Body Measurement in Metrics (Classroom)
2	Pacing and Measuring Distance (School Site)
3	Estimating Heights, Using a Variety of Methods (Classroom)
4	Introduction to the Use of a Compass (School Site and Classroom)
5	Geometric Figures with a Magnetic Compass (School Site)
6	Introduction to Mapping (School Site)
7	Constructing Teaching Compass Courses (School Site or Field Trip)
8	More Fun With the Compass (School Site or Field Trip)
9	Nature's Patterns (School Site or Field Trip)
10	For the Birds (Classroom and School Site)
11	Pollution (Classroom)
12	Pollution
13	Uses of Energy in the Home
14	Yard Census

MATHEMATICS

There is much to be gained by teaching mathematics in the out-of-doors. A student may be able to understand various concepts and have the ability to apply them in the classroom but not have a realistic view of the concept in its practical usage. Through studying mathematics in the out-of-doors, we can provide a direct experience that can help the student bridge the gap between the abstract and concrete.

The metric system as you well know, is not just a fad. It's rapidly becoming an every day encounter in our environment. By the time our students become adults the metric system will be an essential part of their daily lives. The better we acclimate the youth to the new system the easier the change will be for everyone.

As with other concepts the metric system can best be understood through direct experience. Included in some of the following pages are activities that have helped some of our students understand centimeters and meters. If these activities help your students understand the metric system, develop your own direct experiences for metric weight measurements, temperatures, and liquid volume.

We suggest not having students convert from English measures to metric and vice versa. This is of limited value and leads to unnecessary confusion and even boredom. Children who learn to use the metric system by direct experience have absolutely no need to jump back and forth between it and the English system for conceptial understanding.

BODY MEASUREMENT IN METRICS (CLASSROOM)

Discipline Area: Mathematics

Grade Level: Elementary & Junior High

Objective:

A. Introduction and reinforcement of metric system.
B. Metric system relevant to ones self.
C. Use of the body as a measuring tool.

Materials Needed:

A. Meter stick for each group.

Preparation: None.

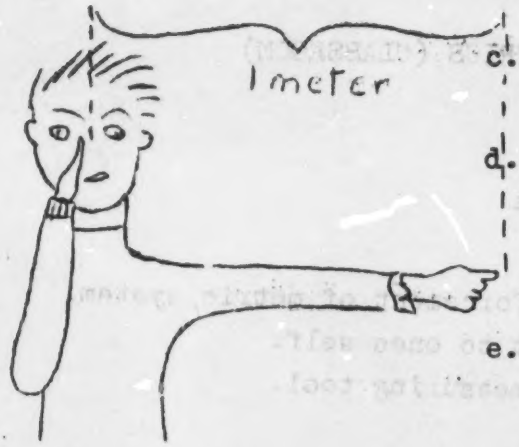
Activity:

A. Work in two's or three's to discover in centimeters.

1. The span of your hand.
2. The length of your foot.
3. The length of your fingernail.
4. The height of your body.

B. In the same groups use meters to measure:

1. How tall you are.
2. The length from fingertip to fingertip when your arms are outstretched. (It should be very close to your height)
3. Measuring from the ground up, where does a meter come to on the side of your body, waist, tip of the pocket, even with your belly button.
4. The Meter Salute
   a. Extend your right arm perpendicular to your body with your fingers out straight.
   b. Place the meter stick along your right arm with the end of the meter stick matching up with the end of your fingers.



c. Place your left hand at the opposite end of the meter stick as that of your right hand.

d. What part of your body does your left hand match up with? eye, nose, shoulder. The distance between the fingers on your right arm and the part of the body which your left hand matches is equal to a meter.

e. Upon command of "Meter Salute", the student will extend the right arm and fingers and bring the left hand up to that part of the body that measured to be a meter.

More Ideas:

A. Measure different items within the classroom using body measurement.

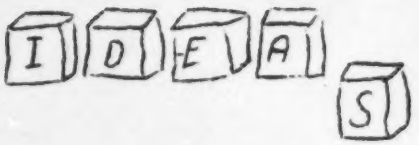
   1. The top of your desk.

   2. The length, width, and height of your classroom.

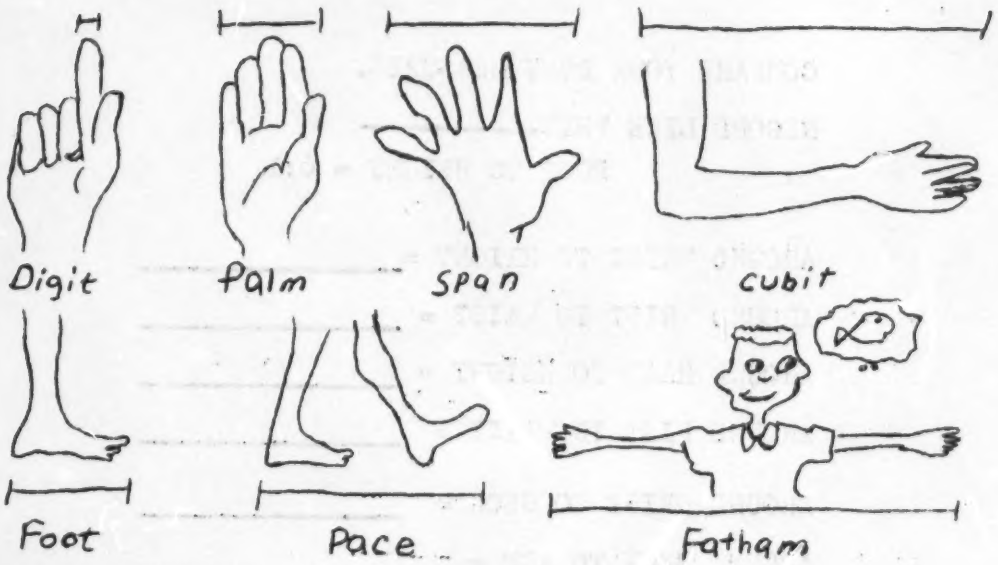
   3. The length of your pencil, etc.

B. Set up charts so the children and you can measure body changes throughout the year, example: the first day of each month the children recheck their body measurements and record changes.

C. You can receive free metric material from your local 7-UP Bottling Company. With this material and wood strips, you can easily make meter sticks. There is also a teachers guide to help give you ideas to introduce metric weights, temperature, etc.



BODY MEASURES



_____ digits make a palm.

_____ digits make a span.

_____ digits make a foot.

_____ palms make a cubit.

_____ palms make a pace.

_____ palms make a fathom.

_____ foot make a pace.

_____ foot make a fathom.

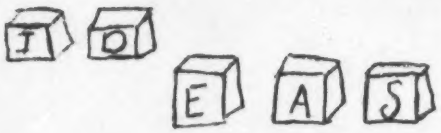
_____ span make a cubit.

_____ span make a fathom.

Which is bigger, a foot or a palm? _____

Which is bigger, a foot or a span? _____

Freeport School District #145, SEE Program



BODY RATIOS

COMPARE YOUR BODY MEASURES.

RECORD LIKE THIS_____

FOOT TO HEIGHT = 6:1

AROUND WRIST TO HEIGHT =_____

AROUND WRIST TO WAIST = _____

AROUND HEAD TO HEIGHT = _____

AROUND FIST TO WAIST = _____

AROUND WRIST TO NECK = _____

AROUND NECK TO ARM = _____

ARM TO HEIGHT = _____

AROUND FIST TO FOOT = _____

FOOT TO ARM = _____

AROUND NECK TO HEIGHT = _____

COMPARE YOUR RATIOS WITH A FRIEND'S RATIOS.

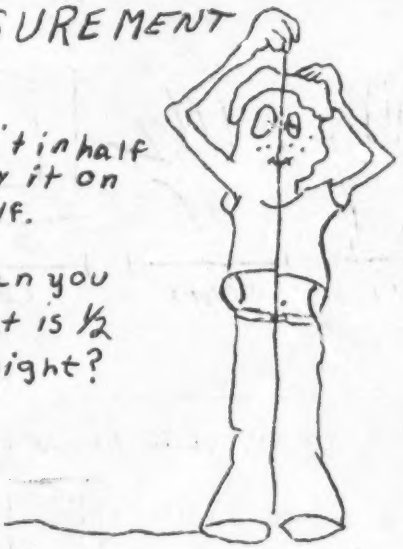
MERRY MEASUREMENT

Cut a piece of string equal to your height

RECORD HERE →

Fold it in half and try it on yourself.

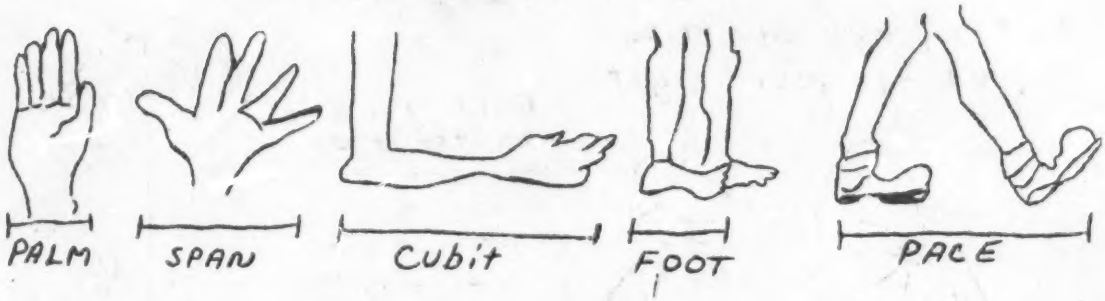
WHAT can you find that is ½ your height?

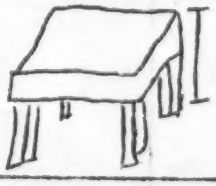
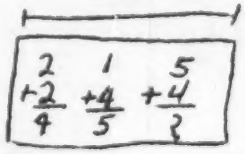


Fold it in thirds. What can you find ⅓ your height? ¼? ⅕? What else?

½ my height	⅓ my height	¼ my height	⅕ my height	what else?

ME AS A MEASURE



What to measure	Guess	Measurement
Door		
DESK TOP		
Desk Height 		
Chalkboard 		
Book		

MEASURING KIT

Directions:

1. Each person copy this chart on his own paper.
2. Each person measure each item.
3. Record the measure of each item in millimeters.
4. Change each mm measure to centimeters by dividing by 10.

   eg. 63 mm - 6.3 cm

   Change each cm measure to decimeters by dividing by 10.

   eg. 27 cm - 2.7 dm

ITEM TO MEASURE	MEASURE IN MILLIMETERS	CHANGE TO CENTIMETERS	CHANGE TO DECIMETERS
1. paper clip			
2. paper fastener			
3. string			
4. straw			
5. piece of cloth			
6. pen			
7. length of envelope			
8. width of envelope			
9. toothpick			
10. index card-width			
11. index card-length			
12. playing card-length			
13. playing card-width			

PACING AND MEASURING DISTANCE (SCHOOL SITE)

Discipline Area: Mathematics

Grade Level: Upper Elementary & Jr. High

Objective:

A. Using steps to measure distances.
B. Lead into the use of the compass.

Materials Needed:

A. Specified distance marked off. (Example 30 meters)
B. Scratch paper and pencils for children.
C. Clipboards

Hints:

A. This activity can be introduced by talking about importance of knowing how to estimate distance accurately. While you are teaching pacing, don't just stand there explaining how to pace, but get involved with them and practice your own pace.
B. It is recommended this activity be taught on level ground.

Preparation:

A. If using metrics, students will need introduction to meters.

Activity:

A. Measuring your pace.
   1. Walk 30 meters and count your steps. To be sure walk it three times or until you get the same number of paces twice in a row.
   2. Divide 30 meters by the number of steps you used to walk 30 meters. To stay away from decimals you may want to reduce centimeters.
      Example. Mary took 50 Step for 30 meters or 3,000cm.

$$50\overline{)3000\text{ cm}}\quad 60\text{ cm}$$
$$300$$
$$00$$

      Mary's step .6 of a meter or 60 cm.

B. Measuring Distance
   1. Walk the distance counting your step.
   2. Multiply the number of steps times the length of your step.
      Example. Mary's pace 60 cm and she walks 46 steps.

$$\begin{array}{r} 60 \\ \times\ 46 \\ \hline 360 \\ 240 \\ \hline 2760 \end{array}\ \text{cm. or } 27.6 \text{ meters}$$

C. To walk a certain distance

1. Divide the distance by the length of your step.
   Example. Mary is to go 17 meters

$$.60\overline{)17.00}$$ 28 steps (round off to nearest step)

2. Walk that many steps.

More ideas:

A. Estimate specific distances between objects on your school grounds. Then pace to see how close you come. You may want to measure exact distance using a tape or a trundle wheel. Start with short distances until the students get the hang of it. See following worksheet.

Worksheet for Estimating and Pacing in Metrics

Estimate the distances between the objects on the column on the left. Then pace to see how close you come. Then measure distance using a tape or trundle wheel.

Object to be measured	Estimation	Pace	Actual
1. Length of a school bus			
2. Length of the bicycle			
3. Distance between the front door & the street			
4. Distance between home plate & first base			
5. Length of one side of the school building			
6. Length of the school block			
7.			
8.			

FIGURE HERE:

ESTIMATING HEIGHTS USING A VARIETY OF METHODS (SCHOOL SITE)

Discipline Area: Mathematics

Grade Level: Intermediate and up

Objective:

A. By using mathematics in the outdoors, children will better understand the relationship of mathematics in their daily lives.

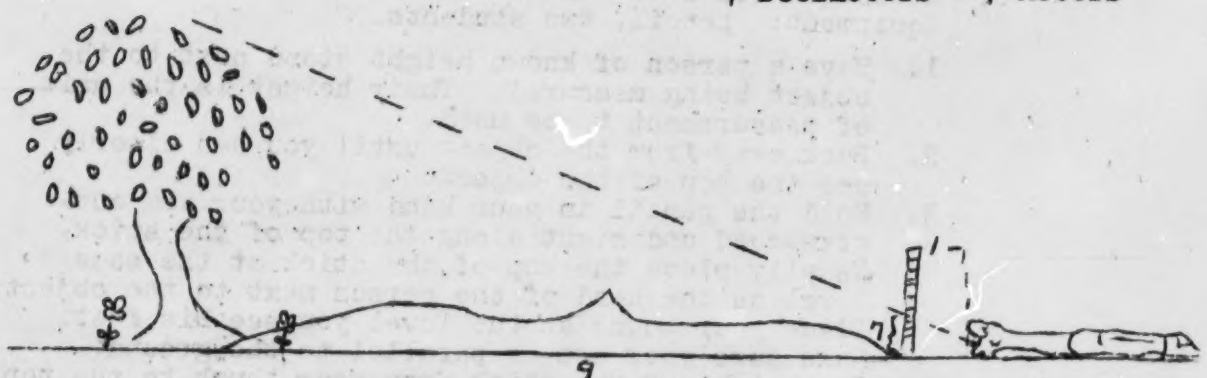
B. To learn to estimate height of objects (trees, buildings, etc.) using methods not dependent on conventional measurement techniques.

Activity:

A. Centimeter to Decimeter or Decimeter to meter (9-1)
Equipment - meter stick, two students working together.

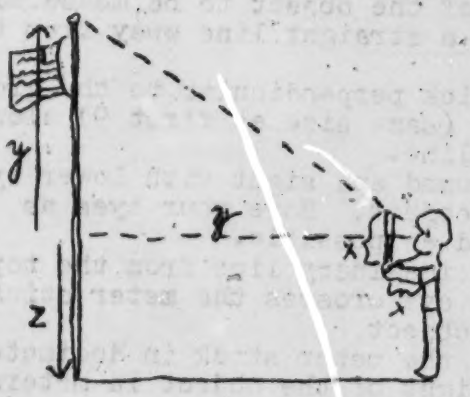
1. Start at the base of the object to be measured.
2. Walk nine steps in a straight line away from the object.
3. Place the meter stick perpendicular to the ground.
4. Take one more pace (same size as first 9) along the same straight line.
5. Lie down on the ground and sight with lower eye to the top of the object. Have your eyes as close to the ground as possible.
6. The point where an imaginary line from the top of the object to your eye crosses the meter stick is the height of the object.
7. The height read on the meter stick in decimeters is equal to the height of the object in meters.

7 Decimeters = 7 Meters



B. Equal sides method.
Equipment: Meter stick and knowledge of pacing, one student.

1. Measure the distance between the palm of your hand and your shoulder.
2. With one hand hold the meter stick at the number that equaled the distance measured in (1).
3. Straighten your arm making sure meter stick is perpendicular to your arm. Make sure numbers decrease as you look up the meter stick.
4. Back away from the object to be measured on level ground, sight along the top of the stick to the top of the object and along the top of your hand to the front of the object. Make sure arm is parallel to the ground.
5. Walk backwards until there is formed an imaginary line from the top of the stick to the top of the object.
6. You are now the same distance from the object as the object is high. Measure or pace the distance to the object, and that will be the height of the object. Do not forget to add your height from your eyes to the ground to the distance for the total height.



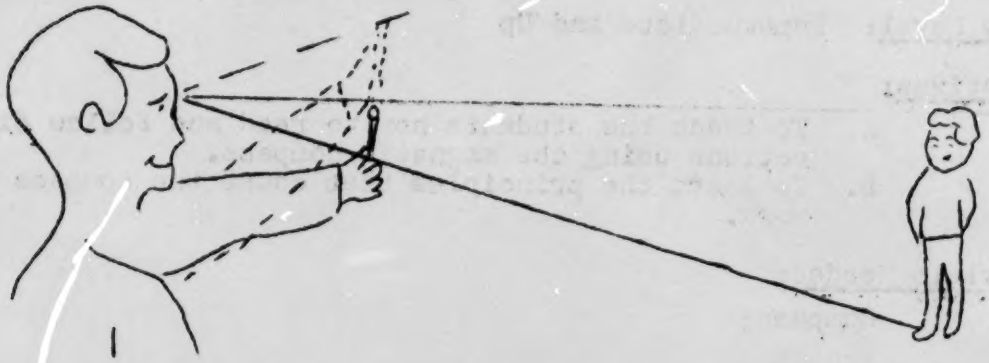
if x = x
then y = y.
z = your height

C. Artist's Method or Pencil Method.
Equipment: pencil, two students.

1. Have a person of known height stand next to the object being measured. Their height is the unit of measurement to be used.
2. Back away from the object until you can clearly see the top of the object.
3. Hold the pencil in your hand with your arm outstretched and sight along the top of the stick. Usually place the top of the stick at the same level as the head of the person next to the object. Place your thumb at the level you see his feet. Make sure your arm is parallel to the ground.
4. The height of the stick from your thumb to the top of the stick is one unit of measurement and equal to the person's height you are sighting.
5. Move the pencil upwards one unit at a time and measure the height of the object in terms of how many units height it is.
6. Multiply the number of units by the persons height to get the total height of the object.

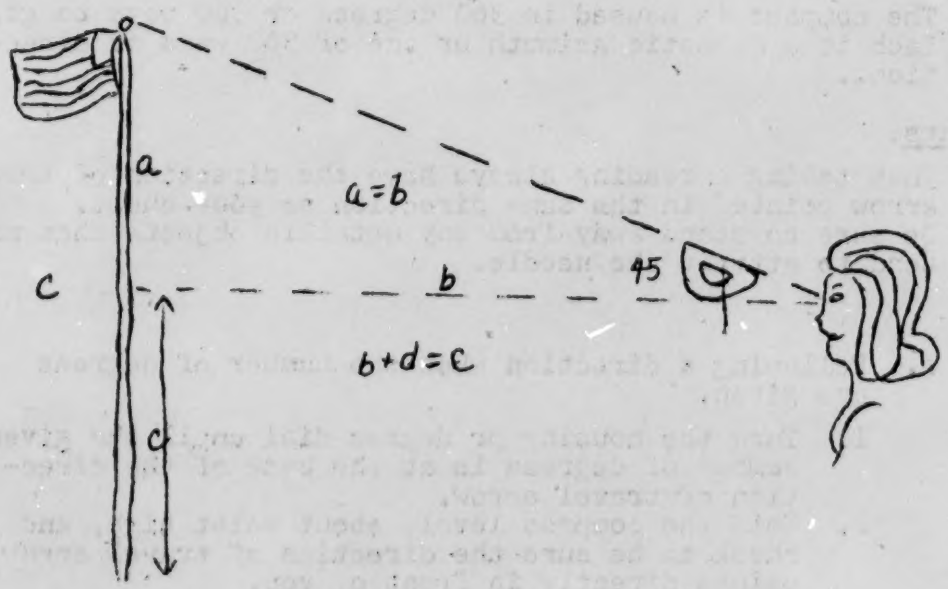
each unit equals _____ centimeters

$$\frac{\text{no. of units}}{\text{no. of units}} \times \frac{\text{length of unit}}{\text{length of unit}} = \frac{\text{height of object}}{\text{height of object}}$$



D. Clinometer.
Equipment: One clinometer per group (a clinometer may be made from wood or by holding a protractor upside down and tying a weighted string to the pivot point), level ground.

1. Hold the clinometer at eye level.
2. Back away from the object until the top of the object is at a 45 degree angle from a horizontal line from your eye to the object.
3. You have just made an isosceles right triangle.
4. The distance from the object to you is the same as the height of the object plus your height from your eyes to the ground.



INTRODUCTION TO THE USE OF A COMPASS (CLASSROOM AND SCHOOL SITE)

Discipline Area: Mathematics

Grade Level: Intermediate and Up

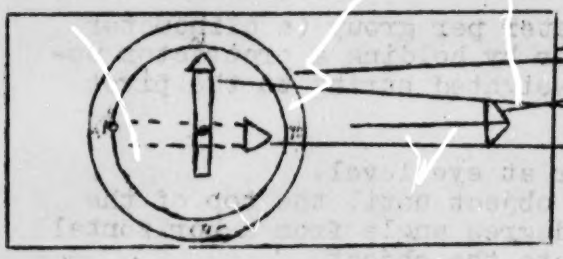
Objectives:

A. To teach the students how to read and follow directions using the magnetic compass.
B. To learn the principles that cause the compass to work.

Materials Needed:

Compasses

Parts of the compass



Basic Concepts:

The north end of the magnetic needle always points towards the magnetic North Pole which is located at a point in the Hudson Bay region of North America.

The compass is housed in 360 degrees or 360 ways to go. Each is a magnetic Azimuth or one of 360 ways or directions.

Helpful Hints:

When taking a reading always have the direction of travel arrow pointed in the same direction as your chest.
Be sure to stand away from any metallic objects that may tend to attract the needle.

Activity:

A. Following a direction when the number of degrees are given.
   1. Turn the housing or degree dial until the given number of degrees is at the base of the direction of travel arrow.
   2. Hold the compass level, about waist high, and check to be sure the direction of travel arrow points directly in front of you.
   3. Rotate your body watching the compass. Keep turning until the magnetic needle rests directly with the stationary needle. You are now facing the correct direction.

4. Look up and sight on an object such as a bush, tree or you may want to use another person and line him up with the direction of travel. Now forget the compass and walk at that object, or pace if you are measuring distance.

B. Finding an Azimuth (or compass direction)

1. Face the object: holding the compass level, about waist high, and be sure the direction of travel arrow points straight ahead of you.
2. Hold the compass steady and rotate the housing or direction dial until the magnetic needle rests directly within the orienteering arrow.
3. Read the degrees which indicates the azimuth or direction.

C. Treasure Hunt: Have each student place his treasure between his feet. Then have him choose any degree direction (azimuth) and follow it for 10 steps. From that point, have them add 120 degrees to their previous reading and follow it for 10 steps. Add another 120 degrees to the reading and again go 10 steps. He should be at his starting point. Why did we return to the starting point?
Emphasize to the student the importance of picking an object to walk toward that is in line with your azimuth. They should not look at their compass when they walk toward the object!

D. For additional compass excercises see activities 5, 6, 7, & 8.

GEOMETRIC FIGURES WITH A MAGNETIC COMPASS (School Site)

Objectives: To provide experience with the magnetic compass.
To improve concepts of simple geometric figures.

Equipment: A compass and six or seven colored flags or markers for each child or pair of children. An open field or area is needed.

Preparation: Provide instruction about azimuths (degrees) and the use of a compass (this exercise provides experience following such instruction). It helps if several colors of markers are used; all markers of a particular child should be the same color.

Activity: Distribute children (having several steps between each). Do not inform them of the types of figures they are constructing.

A. Constructing a square:

1. Place first marker at feet.
2. Walk 10 steps at an azimuth of 90° and place second marker.
3. Walk 10 steps at 180° and place the third marker.
4. Walk 10 steps at 270° and place the fourth marker.
5. Walk 10 steps at 360° and place the fifth marker.

Now step back to look at the area each enclosed. Measure the distance between the first and fifth markers. Review the directions. What type of figure should have resulted? Analyze errors. (Markers 1 and 5 should be at the same point.)

B. Constructing an equilateral triangle:

1. Place first marker at feet.
2. Walk 10 steps at 30° and place second marker.
3. Walk 10 steps at 150° and place third marker.
4. Walk 10 steps at 270° and place fourth marker.

Measure the interval between the first and fourth markers. Review directions; discuss errors. Analyze figures as to length of sides, angles, etc. Why a 120° difference between each of the three azimuths, but only 60° in each of the angles of the triangle?

C. Constructing a trapezoid:

1. Place first marker at feet.
2. Walk 10 steps at 30° and place second marker.
3. Walk 10 steps at 75° and place third marker.
4. Walk 17 steps at azimuth of 210° and place fourth marker.
5. Walk 7 steps at 300° and place fifth marker.

Analyze--measure error--discuss figures, relationship of sides, etc., as in the case of the square and triangle.

D. Constructing a hexagon:

1. Place first marker at feet.
2. Walk 10 steps at 90° and place second marker.
3. Walk 10 steps at 150° and place third marker.
4. Walk 10 steps at 210° and place fourth marker.
5. Walk 10 steps at 270° and place fifth marker.
6. Walk 10 steps at 330° and place sixth marker.
7. Walk 10 steps at 30° and place seventh marker.

Analyze as before.

Follow-up Indoors:

Construct the same figures to scale on paper. Use protractors instead of magnetic compasses and the same directions given outdoors. Orient properly with a north-south line on the paper. (Is this a map-making activity?)

INTRODUCTION TO MAPPING (SCHOOL SITE)

Discipline Area: Mathematics

Grade Level: Elementary and Jr. High

Objective:

A. Reinforce the use of the compass as a practical tool.
B. Introduction to map making.

Materials Needed:

For each study group
1 compass
large drawing paper
ruler with metrics
pencil
drawing board

Preparation:

A. Children should have knowledge of use of the compass and the length of their pace.

Helpful Hints:

A. This activity can be introduced by talking about pirates and their treasure and how their treasures were hidden. You can then work up to how maps have been developed and are made today.
B. Make sure that you do the activity first to suggest the best area to start.
C. The first time try to centrally locate yourself between objects to be mapped.

Activity:

A. Decide on a scale to be used. The scale depends on the size of the area to be mapped. (Example) Five steps equals one centimeter. If your step is $\frac{1}{2}$ meter then on your map one cm = $2\frac{1}{2}$ meters.
B. Go to the designated area outside, draw a straight line down the center of your paper. This is your North-South line.
C. Orientate your paper to North-South and keep it orientated throughout this process.
D. Make an "X" near the center of the line to represent where you are.
E. Choose the building you wish to locate first. Sight on a corner of it and note the degree reading.
F. Lay the compass on the map so that either of the edges of the long sides is touching the center of the X. Make sure to use the same edge the whole process.
G. With the bearing still set on the direction of travel arrow orientate the compass to North. The side of the compass must remain over the center of the X during this step.

H. When the compass is oriented to the North, and with the edge still on the center of the X, draw a light line with your ruler.

I. Repeat the process on another corner of the same building.

J. You now know that your building is located along those lines at some point.

K. Move 10 steps at a right angle to your North-South line. Make sure you can still see both points of the building. Place a (T) at a point scaled to paces.

L. From your new point a (T) repeat steps E-I. Where the lines intersect is the location of the corners of your building. They will also be located according to the scale of your map.

M. To find the distance from your (T) to the corners of the building, measure the distance with your ruler between (T) and the point where your lines intersect, and refer to your scale. (Example) Scale: 1cm = 2.5 meters, measured distance on map from (T) to point of intersection is 20 cm. Then actual distance from (T) to point if intersection is 2.5 X 20 = 50 meters.

N. You can locate any other building or object on your map by repeating the process on these objects.

O. Once you have drawn in all the buildings. You can add roads and other landscaping features to your map.

CONSTRUCTING TEACHING COMPASS COURSES (SCHOOL SITE OR FIELD TRIP)

Discipline Area: Mathematics

Grade Level: Upper Elementary

Objectives:

A. To apply and develop compass skills.
B. To orient students to an area or to serve as an awareness exercise.
C. To provide identification experiences (trees, rocks, etc.)
D. To help show as concept (ecology, geology, similarities and differences, etc.)

Compass course should include:

A. Teaching stations and or locations.
B. Comments, questions and activities at each station relative to what the students are to observe, measure, do or accomplish.
C. Directions leading learners from station to station.

Materials needed:

Compasses
Tags for directions

Activity: Constructing teaching compass course.

A. Select the stations and develop activities, data gathering, observations and questions applicable to each. Examples of stations: Dead tree, Erosion, Animal home, etc.
B. Determine the sequence of the stations in the compass course.
C. Develop directions to lead students from station to station.
    1. Measure the distances.
    2. Determine the azimuths from station to station. Check and recheck!
D. A course may be designed to provide directions for completing the entire course at the beginning or students may discover directions as they proceed from station to station.
E. Don't forget that for each course you set up you can take back readings and have an additional course.

Student Preparation (they may work in small groups or individually depending the amount of compass available.)

A. Students should know reason for compass course.
B. Students should know how to determine distance through pacing. (refer pacing activity)
C. Students should know how to use a magnetic compass.

MORE FUN WITH THE COMPASS (SCHOOL SITE OR FIELD TRIP)

Discipline Area: Mathematics

Grade Level: Elementary & Jr. High

Objective:

A. Reinforce use of compass

Activity:

A. Compass Relay

Select team members and station them at certain points along the course, with their locations unknown to the other team members. The first runner has the reading for the entire team. He takes the first reading which will lead him to the second runner, together they take the next reading and run to the third team member, etc. Make sure team members do not know who else is on their team. Check to make sure team has the correct members.

B. Compass Treasure Hunt

Individuals are given a list of readings (of similar difficulties and distance) which go different ways, but all end up at the same place. At this place there is a prize hidden for the first one who gets there.

C. The following are old Indian sayings. Use your compass to find out if they are true.

1. Moss grows thickest on the North side of the tree.
2. Bark has more growth on the North side of the tree.
3. Pine tops point in an Easterly direction.
4. The North side of a hill is more moist and more mossy than the South side of a hill.
5. The South side of the hill has more broken branches and twigs, than the North side of a hill.

NATURE'S PATTERNS (SCHOOL SITE OR FIELD TRIP)

Discipline Area: Mathematics

Grade Level: Intermediate

Objective:

To discover and build the students awareness of geometric patterns and shapes in nature and man made items.

Materials:

Pencil and notebook.

Activity:

Many different shapes and patterns exist in nature. Some of the most common are spirals (pinecone, path of a dropping maple seed, tendrils of vines, a snail, etc.) and circles (flowers, tree trunks, etc.). Students should see the relationship between geometry and nature and how man has used some of these patterns to benefit himself.

1. Have students search for these shapes and patterns first in nature then man made items.
2. Try to find examples of other designs and find out what these new patterns are called.

FOR THE BIRDS (CLASSROOM & SCHOOL SITE)

Discipline Area: Mathematics

Grade Level: Intermediate

Objective:

A. Create learning environment for observation, data gathering, and appreciation of birds.

Material Needed:

A. Bird feeders; can be made easily (consult library for different construction ideas.)

B. Bird Food (Money may be obtained from once a month bake sales etc.)

C. Feasible area North side your class window for bird feeder.

Activity:

A. Data gathering.

1. Keep a record of how much bird seed is used each day for two weeks. Find the average amount used each day.

2. Record the cost of a bag of bird seed. Figure the cost per ounce; per gram; per daily ration. How much does the seed cost in larger bags? Is the larger bag a better buy? How many days should a bag last?

B. A variety of other discipline areas can be enhanced with the use of a bird feeder. Art, Science and Languages activities can easily be centered around the bird feeder.

#11

POLLUTION

Activity: The Cost of Pollution

Discipline Area: Mathematics

Objectives:

1. Pupils will use mathematics to determine what pollution is costing.
2. Pupils will relate mathematics to real life situations.

Activities:

1. If it costs 35 cents for each piece of roadside litter picked up, how much will a six pack of discarded beer cans cost?
2. If you pick up 10 pieces of roadside litter, how much will you save the taxpayers? If each member of the class does that, how much is saved?
3. If it costs each family $3.50 per month for trash pick up, how much does it cost for 50 families?
4. If you pick up 10 returnable bottles and get 5 cents each, how much do you make?
5. At 35 cents each for roadside trash pickup, how much did you save the taxpayer?
6. If recyclable aluminum is worth $200 a ton, how many canoes at $100 each can you buy with the money from a ton of aluminum?
7. If your class brings in 20 pounds of wastepaper a day, how long will it take you to collect a ton?
8. If clean water can save a family $87 a year, how much could clean water save the families of pupils in this class?
9. If strip mining destroys 4000 acres of land a week, how many acres are destroyed in a year?
10. If automobiles cause 52% of the air pollution, how much pollution comes from other sources?

Evaluation: 75% of pupils should have 70% of problems right.

ACTIVITY: Pollution

DISCIPLINE AREA: Math

PURPOSE: To make the student aware of pollution he is contributing to the total community and U. S. problem.

CONCEPTS COVERED: 1, 2, 6, 7, 9, 11, 12, 13, 15, Pages 3, 4, 5.

OBJECTIVES: The student will:

1. be relating math to real life
2. develop an attitude for responsibility toward personal resourcefulness
3. suggest how increased population growth will affect the pollution problem
4. compute problems on pollution

LEARNING ACTIVITIES:

a. Invite a possible resource person from the local landfill site to explain the operation of the site.
b. Use the statistics presented in the following examples.

1) The population of our community is _____ and _____ tons of garbage per _____ (day, wk.) are collected.
What is amount of garbage collected in a month?

2) If you contribute 6 pounds of garbage per day, how much will you have contributed in month?_____ in a year? _____

3) 48 tons of garbage are taken to the landfill by a five ton truck, how many trips were made?

4) It took two years to fill 1/6 of the site, how many years will it take to fill the entire site at this rate? _____

5) The U. S. spends $4 billion on garbage collection and disposal. If $3,200,000 is spent for the collection, how much is left to spend for disposal?
_____

6) Rats are a problem at a landill site. If a female rat has nine litters per year with 12 baby rats per litter, how many off-spring will she produce in a year? _____

7) Cars add to our pollution problem.
Four fathers drive to work daily to _____ (nearby city).
Each car uses 4 gallons of gasoline per day. How much gasoline could be saved if all four fathers rode in one car? _____

ENERGY

Activity: Uses of energy in the home

Discipline Area: Science

Grade Level: Intermediate and Junior High

Activities:

1. Children will be given a list of energy users in the home. Each will check whether it uses electricity or gas (or some other source), check if they have it in thier homes, and then ask their parents and grandparents (or someone of approximate age) to check those in their homes when they were children.

2. Children will learn the names of the companies supplying their energy.

3. Children will find out what each company uses as its source of energy, and where the company gets its supply.

Evaluation: Children will prepare graphs showing the growth in the use of energy from approximately 1915 to the present time.

A similar lesson could be made up for the uses of power on the farm, in shops, and in other businesses.

ENERGY USERS IN THE HOME

Appliance	Type of Energy	Now	About 1945	About 1915
stove				
lights				
refrigerator				
television				
radio				
water heater				
freezer				
clothes dryer				
fan				
furnace				
vacuum cleaner				
washer				
air conditioner				
hair dryer				
toaster				
fry pan				
organ				
dishwasher				
blender				
mixer				
toothbrush				
saw				
sander				
power tools				
garbage disposal				
garbage compactor				
blanket				
phonograph				
razor				
knife				
hedge trimmer				
garage door opener				
mower				
can opener				

Can you think of others?

YARD CENSUS

Discipline Area: Mathematics

Purpose: To help the student develop an awareness of the infinite variety of natural and man-made objects which are part of the school site environment.

Objectives: The student will:

1. Demonstrate his power of observation to identify natural and man-made objects on the school grounds.
2. Display his aesthetic values by pointing out those items which have low aesthetic value and those which have high aesthetic value.

Learning Activity: Many of you may have heard of the "people" census that the government takes every 10 years. In your year there are many living things. There are also many things that man has put on the school site. Below is a check list. Take a walk around your yard and check off all of the things you see.

Plants or Animals

ant or ant hill	___	dandelion	___	flagpole	___
squirrel nest	___	clover	___	fence	___
wasp nests	___	wild strawberry	___	telephone pole	___
holes in ground made by insect	___	crab grass	___	sidewalk	___
bird nest	___	moss	___	parking lot	___
bird	___	shrub	___	play area	___
animal print	___	vine	___	trash cans	___
half eaten leaf	___	a yellow weed	___	fire plug	___
spider	___	lichen	___	stop signs	___
earthworm	___	gall	___	bicycle rack	___
grasshopper	___	evergreen	___	gutter	___
bee	___	broadleaf tree	___	light meter	___
insects on bark of tree	___	mushroom	___	transformer	___
pill bug(sowbugs)	___	tree-fruit	___	cement area (blacktop)	___

Which animal do you think is the most numerous on the site?

Which plant has the greatest number? ___ Why does this plant grow so well on the school site?

Which of the man-made items are pretty? ___ Which are ugly? ___ Could the ugly ones be made better looking? ___ How?_____